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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/691,353	10/18/2000	James W. Adkisson	BUR9-1999-0300-US1	3972

30743 7590 03/18/2005

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EXAMINER

NGUYEN, KHIEM D

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 03/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/691,353

Applicant(s)

ADKISSON ET AL.

Examiner

Khiem D. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 14-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 14-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 October 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 07th, 2005 has been entered. A new rejection is made as set forth in this Office Action. Claims (1 and 14-30) are pending in the application.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

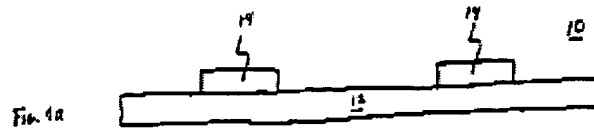
A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 14-19 and 22-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Doyle (U.S. Pub. 2003/0006410).

In re claim 1, **Doyle** discloses a method of forming a field effect transistor (FET) transistor, comprising: providing a substrate **12**; forming a layer **14** on the substrate, the layer having exposed vertical side surfaces on opposite sides of the layer, the layer being able to support epitaxial growth on the side surfaces (page 2, paragraph [0034] and **FIG. 1a**);

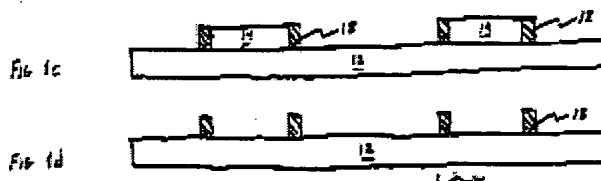
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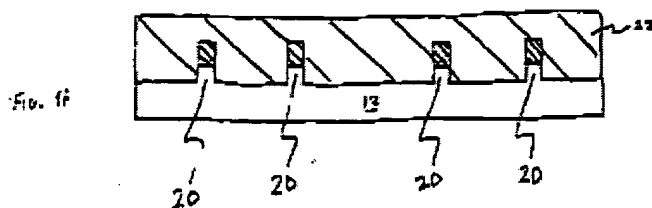
forming an epitaxial channel 16 on the each of the exposed side surfaces of the layer, the channel having an exposed first sidewall opposite the vertical side surface of the layer (page 2, paragraph [0034] and **FIG. 1b**);

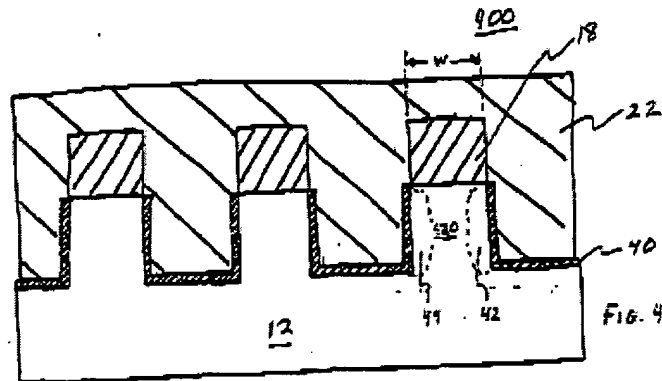


removing a channel on a first vertical side surface of the layer (page 2, paragraphs [0036]-[0037] and **FIG. 1c**) and then removing the layer (page 2, paragraph [0037] and **FIG. 1d**), thereby exposing a second vertical sidewall of the channel formed on the second vertical side of the layer;



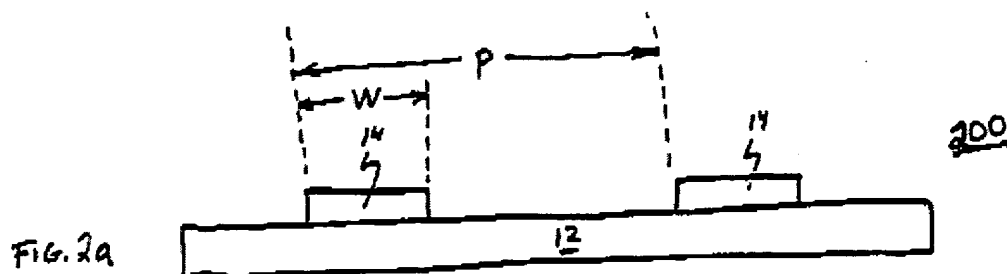
forming a second channel 20 in place of removed channel; and forming a gate 22 adjacent to at least one of the sidewalls of the channel and the second channel (42 and 44), there being a gate dielectric 40 between each channel (42 and 44) and the gate 22 (page 2, paragraph [0039], page 3, paragraph [0051] and **FIGS. 1f and 4**).





In re claim 14, Doyle discloses a method for forming a double gated field effect transistor (FET), comprising the steps of: forming on a substrate a first and second epitaxially grown channels, the channels having vertical side surfaces extending up from the substrate, wherein the second channel is grown following removal of a central semiconductor region centered between the channels upon one of whose opposite vertical sides the first channel was grown (page 2, paragraphs [0036]-[0037] and **FIGS. 1c-d**); etching areas within a silicon layer to form a source and a drain, wherein a side surfaces of the source and the drain contact opposing end surfaces of the first and second epitaxially grown channels; and forming a gate 22 that contacts a top surface and two side surfaces of the first and second epitaxially grown channels (42 and 44) and a top surface of the substrate 12 (page 2, paragraph [0039], page 3, paragraph [0051] and **FIGS. 1f and 4**).

In re claim 15, Doyle discloses wherein the forming step comprises the steps of: forming first and second semiconductor lines 14, each end of the silicon lines contacting one of the source and the drain (page 2, paragraph [0041] and **FIG. 2a**);



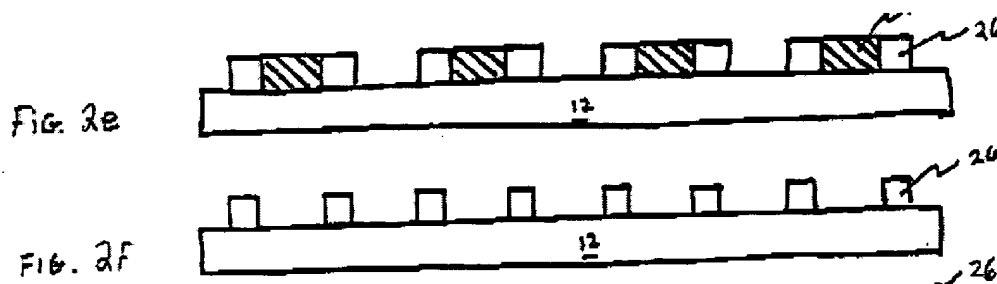
forming an etch stop layer 16 on an exposed side surface of each of the first and second semiconductor lines (page 2, paragraph [0042] and FIG. 2b);



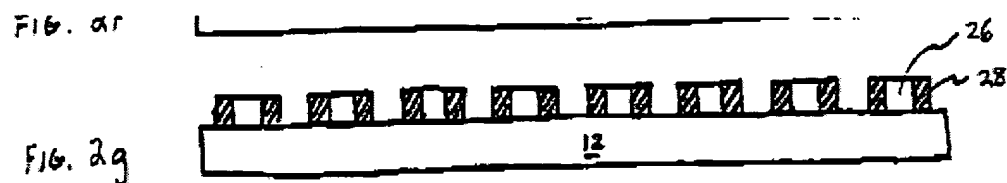
epitaxially growing first and second semiconductor layers 24 on each etch stop layer (page 2, paragraph [0043] and FIG. 3c);



etching away the first and second semiconductor lines 14 and the etch stop layers 16 (page 3, paragraphs [0044]-[0045] and FIGS. 2e-f);

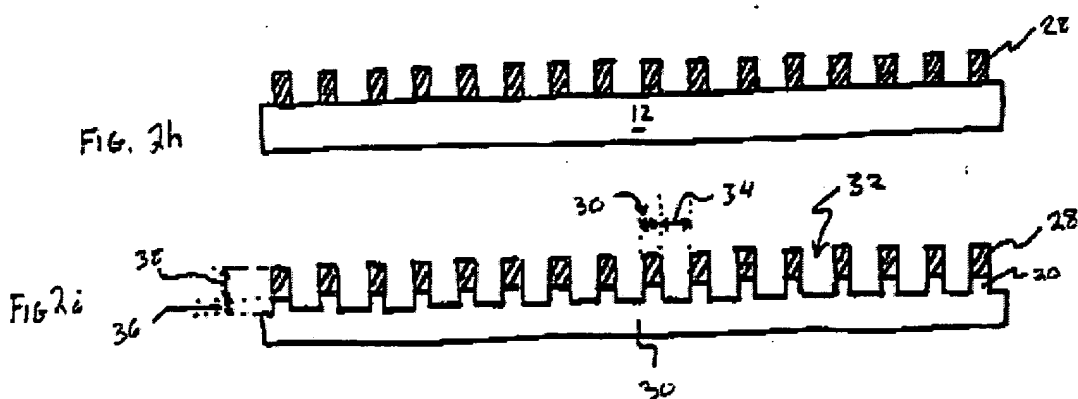


filling areas surrounding the first and second epitaxially grown semiconductor layers and between the source and the drain with an oxide fill 26 (page 3, paragraph [0046] and FIG. 2g);



and etching a portion of the oxide fill to form an area that defines a gate 22, wherein the area that defines the gate is substantially centered between and substantially parallel to the source and the drain (page 3, paragraph [0051] and **FIG. 4**);

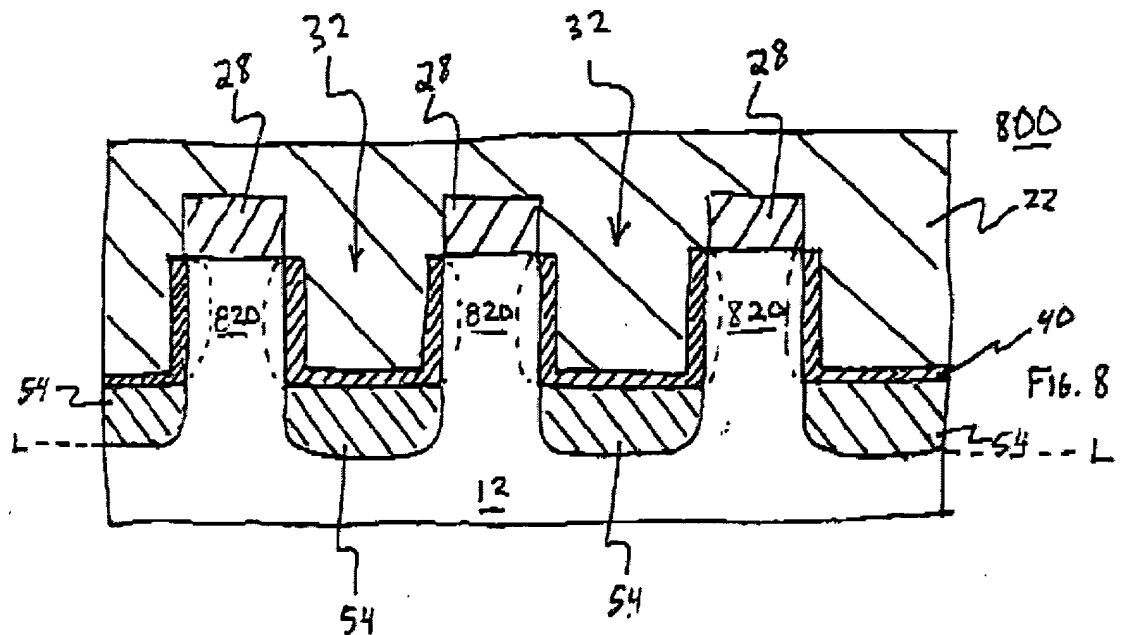
In re claim 16, **Doyle** discloses wherein the method as recited in claim 15, further comprising the steps of: etching the oxide fill between the gate the source to expose the first and second epitaxially grown silicon layers; and etching the oxide fill between the gate and the drain to expose the first and second epitaxially grown silicon layers (page 3, paragraphs [0046]-0047] and **FIGS. 2h-i**).



In re claim 17, **Doyle** discloses wherein the method as recited in claim 16, further comprising the step of forming an oxide on the first and second epitaxially grown silicon layers (**FIG. 2d**).

In re claim 18, **Doyle** discloses wherein the oxide is silicon dioxide (page 3, paragraph [0044]).

In re claim 19, **Doyle** discloses wherein the method as recited in claim 14, further comprising the steps of: implanting a portion of the epitaxially grown silicon layers between the gate and the source; and implanting a portion of the epitaxially grown silicon layers between the gate and the drain (page 4, paragraph [0057] and FIG. 8).



In re claim 22, **Doyle** discloses wherein the method as recited in claim 14, further comprising the step of forming a contact on each of the gate, the source and the drain (page 4, paragraph [0059] and FIG. 9).

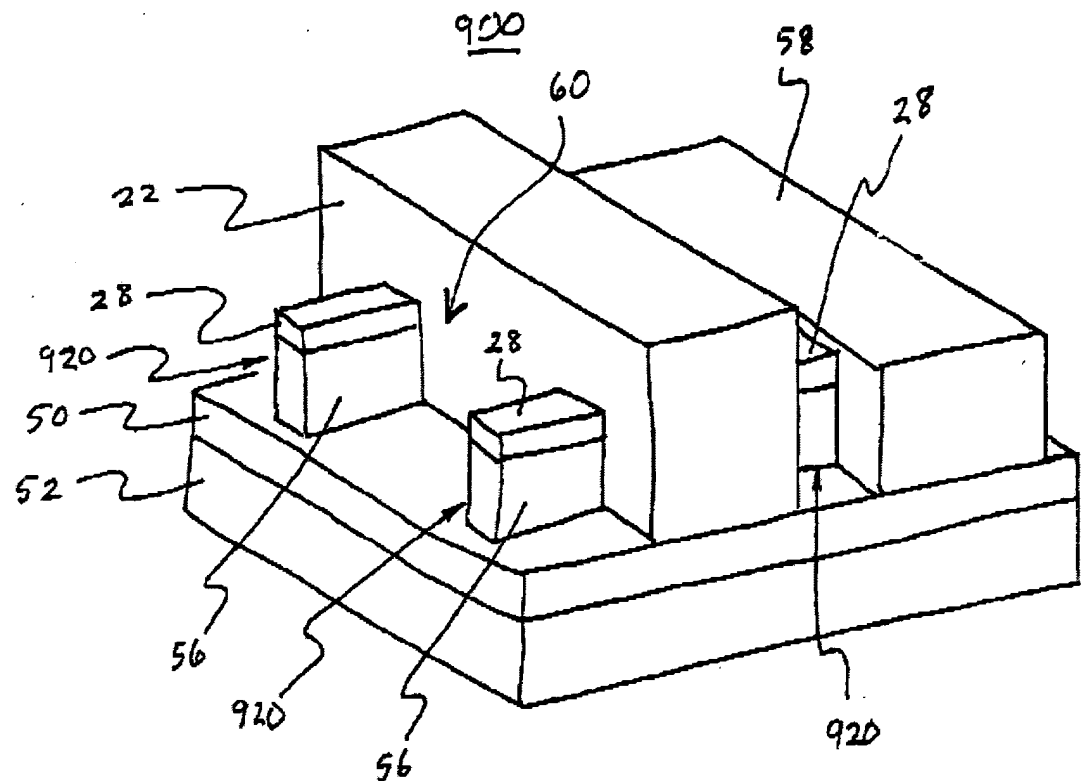


FIG. 9

In re claim 23, Doyle discloses wherein the method as recited in claim 14, wherein the gate material is polysilicon (page 2, paragraph [0039]).

In re claim 24, Doyle discloses a method of forming an FET, comprising: forming on a substrate a first semiconductor layer having first and second ends and a central region that is thinner than the first and second ends, the central region having first and second side surfaces extending upward from the substrate, the semiconductor layer being able to support epitaxial growth on the first and second side surfaces; epitaxially growing a semiconductor channel region on at least one of the first and second side surfaces of the central region of the first semiconductor layer, a first side of the channel being exposed;

removing the central region of the first semiconductor layer, thereby exposing a second side of the channel; forming a dielectric layer **40** on exposed surfaces of the semiconductor channel region (**42** and **44**); and forming a gate electrode **22** on the dielectric layer (page 3, paragraphs [0044]-[0051]).

In re claims 25-27, **Doyle** discloses where in the semiconductor channel region is formed of an alloy of silicon and a Group IV element wherein the semiconductor channel region is formed of a material selected from the group consisting of silicon, silicon-germanium, and silicon-germanium carbon (page 3, paragraph [0054]).

In re claim 28, **Doyle** discloses wherein the step of removing the first semiconductor layer does not appreciably remove the semiconductor channel region (**FIGS. 2a-i**).

In re claim 29, **Doyle** discloses wherein an etch stop is epitaxially grown between the first semiconductor layer and the semiconductor channel region (**FIG. 4**).

In re claim 30, **Doyle** discloses wherein the method as recited in claim 24, wherein the gate electrode is formed of a material selected from the group consisting of polysilicon (page 2, paragraph [0039]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doyle (U.S. Pub. 2003/0006410).

In re claims 20 and 21, **Doyle** discloses implanting a portion of the epitaxially grown silicon layers between the gate and the source and implanting a portion of the epitaxially grown silicon layers between the gate and the drain (page 4, paragraph [0057 and FIG. 8) but does not explicitly disclose wherein the implanting step is in the range of 10 to 45 degrees relatives to a vector perpendicular to a top surface of the epitaxially grown silicon layers and wherein the implants are done in a series at approximately 90 degrees relative to each other.

However, there is no evidence indicating that the implanting angle ranges is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D. Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.
March 16th, 2005



W. DAVID COLEMAN
PRIMARY EXAMINER